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399229

TEC DEVELOPMENT INTERNATIONAL

PRESENTATION TO:

FELICIA KIRKSEY
PROJECT MANAGEMENT DIVISION
PROJECT MANAGER/CIVIL ENGINEER
THE US ARMY CORPS OF ENGINEERS

BSI ENVIRONMENTAL, INC.

WAUKEGAN HARBOR SEDIMENTS ENVIRONMENTAL REMEDIATION RECOMMENDED STATEMENT OF WORK

FEBRUARY 23, 2004

BSI ENVIRONMENTAL, INC.

WAUKEGAN HARBOR SEDIMENTS
ENVIRONMENTAL REMEDIATION

INTRODUCTION

This proposed Statement of Work (SOW) is for the treatment and utilization of PCB (Poly chlorinated Biphenyl (Aroclor 1248) contaminated sediments dredged from the Waukegan Harbor. It was prepared by BSI Environmental, Inc. (BSI) as a follow up to the bioremediation bench test conducted on harbor sediments sampled on December 2, 2003.

The upper portions of sediment accumulations in Waukegan Harbor areas have been contaminated due to former industrial activities. The U. S. Army Corps of Engineers (USACE) has dredged the outer harbor areas of Waukegan Harbor as recently as 1991 and has instituted a program of maintenance dredging in the approach channel. Sandy sediments removed from these areas are clean and suitable for unconfined lake disposal or nourishment of nearby beaches.

Dredging of the inner portions of the harbor was discontinued after 1972 because the sediments were classified as polluted (USACE 1989). Since that time the USACE has investigated alternatives for confined disposal facilities, none of the proposed alternatives have been approved. Consideration of using the dredged sediments to develop nearby upland sites has recently been renewed. Treatment to reduce toxicity prior to placement at these sites is now under consideration as a condition of such upland beneficial use.

BSI Environmental has conducted bench studies on Waukegan Harbor sediments. These studies have shown that biological [1]treatment can reduce the concentration of PCBs to below levels required for upland placement. This biological treatment is economical and environmentally benign.

The bioremediation process is applicable to most biodegradable compounds. This is true so long as the availability of organic matter is sufficient to maintain a desired metabolic rate, and the physical properties of the mass are such that heat produced by the breakdown of the organics can be managed to obtain the correct treatment temperatures.

Bioremediation is a biological process in which microorganisms convert organic matter into a soil-like material called humus. To accomplish this, alternately anaerobic and aerobic medium conditions are controlled in a mass setting. This is achieved by admixing substrates that offer available nutrients in biological terms to microbes in the contaminated material,

[1] BSI Bench studies in Alphacon GmbH treatability labs in Germany. January – February 2004

thereby inducing a biological process. The oxygen consuming substrates provide an anaerobic medium while intensive turning and mixing of the degrading mass introduces short bursts of oxygen. The primary outcome of biotreating contaminated soils or sediments is to convert specific organic hazardous constituents into innocuous end products. Additionally, soils or sediments that have been contaminated with organic compounds cannot be composted in their natural form because they do not typically contain sufficient amounts and types of admixing substrates to maintain the conditions necessary to destroy the contaminants. As a result, specific amendments must be added to the contaminated material to create a suitable bioremediation environment.

Pollutants such as petroleum and PCB's are organic and can be degraded using this process. To effectively manage the process, a recipe of amendments must be developed to provide the microorganisms the optimum environment in which to live. Numerous factors determine the proper compost recipe. For example, one important factor is the carbon-to-nitrogen ratio (C:N). Additional factors include; moisture, pH, nutrients, structure, degradability, percentage of organic matter, cost and seasonal availability.

BSI uses its extensive contaminated sediment treatment experience to select amendments based on analyses of existing soil quality and availability of various amendments near the project site. Overall performance, cost and availability are deciding factors.

Demonstration or pilot projects are frequently performed as the initial step in full scale treatment. This demonstration helps determine optimum ranges for site specific variables. By manipulating process variables, optimum performance of the treatment system is determined. The information gathered during this small demonstration is then implemented in full-scale operations.

Table 1. Target Cleanup Level for Composting of Waukegan Harbor Sediments for Upland disposal, Waukegan, Illinois,

Constituent	Target Cleanup Level (mg/Kg)
Aroclor 1248	1.0

As shown in Table 1, this target cleanup level will be the cleanup criteria for the full-scale corrective measure.

Table 3. [2]Preliminary Quantities and Assumptions, Waukegan Harbor Sediment Waukegan, Illinois

	Volume of the sediment above the contaminant level	
Contaminant level	m3	yd3
0	195,598	255,647
1.0	121,512	158,817
2.0	101,059	132,084
3.0	76,016	99,354
4.0	46,872	61,261
5.0	25,628	33,496
10.0	2,369	3,097
15.0	822	1,074
20.0	260	340
25.0	34	45

As shown in Table 3, the estimated in-harbor PCB sediment volume which may require remediation or remedial action is 158,817 yd^3 (121,512 m^3). In addition 4,000 yd^3 (1,307 m^3) of sediment is stockpiled on the former Manufactured Gas Plant property. This material was removed during the construction of slip #4 and sampling has shown that it is also contaminated with Aroclor 1248. The total of these sources is 162,817 yd3 (124,573 m^3). For scheduling and costing purposes, a 10 percent sediment expansion factor was used, resulting in a total estimated sediment volume of 179,099 yd^3 (137,030 m^3). Consequently, the full-scale system shall be designed to treat 179,099 yd^3 of sediment.

It is contemplated that the dredging activities will be completed by others using either clamshell and barge or a hydraulic system. The dredged sediments will be deposited at a temporary upland site where free water will drain by gravity. BSI may then take the drained sediments to the North Treatment Center (NTC) for further dewatering and bioremediation.

[2] USACE estimate 11-2003

SUMMARY STATEMENT OF WORK

GENERAL

BSI is willing to consider a contract to perform remediation of the Dredged harbor sediments. The basics of this effort are outlined in the following points. Included are assumptions that clarify BSI's understanding of the anticipated situation.

Staff at the NTC will include a Project Manager / Site Superintendent. The Project Manager will also function as the Site Health and Safety Officer and will provide oversight of Subcontractors. The Project Manager or other BSI staff also will lead sediment handling, treatment and product sampling activities.

All labor and equipment, necessary to transport, treat and stockpile the dredged sediments, will be provided by BSI or its subcontractors.

BSI and any subcontractor shall adhere to all work plans (Construction/Operations & Maintenance Plan [COMP], Quality Assurance Plan [QAP], and Corporate Health and Safety Plan [CHSP]) during the conduct of this project. BSI will be responsible for work plan development and submittal and will review these documents to ensure they reflect the procedures intended for use during the project.

TREATMENT FACILITY

BSI believes that the nearby former OMC building, known as the OMC North Plant, to be worth considering as a remediation facility. It is large enough to allow treatment of all sediments in a reasonable time line. In addition there may be areas available to temporarily store sediment waiting for treatment as well as treated material that has been remediated to expected cleanup levels and ready for transport to designated beneficial use sites.

As and alternate, treatment could be performed in a combination of outside and enclosed process areas. BSI has temporary buildings that can be set up to house the treatment activities. These metal frame buildings have been used extensively on remediation projects and have offered an acceptable level of containment and environmental control.

BSI shall be responsible for providing a field office, employee support, and sanitary facilities. BSI will transport equipment needed in time for each phase of the work. It is assumed that BSI will be responsible for all activities needed to remove the contaminated sediment from the drainage location, transport, screen, compost and return the treated sediment to a designated location. All treating activities involving contaminated sediment shall take place within the former OMC building composting facility. It is assumed that the buildings shall be capable of withstanding anticipated weather conditions, including rain, snow, and wind.

FIELD OPTIMIZATION / DEMONSTRATION PHASE

A field optimization test will be conducted to adjust operational parameters to meet Waukegan field conditions. This phase will run concurrent with setting up of the full scale treatment facility. This initial step will facilitate scale up of the mix design and fine tuning the batch management schedule developed in the laboratory bench tests. Because the Designated Stockpile, which is located on the former Manufactured Gas and Coke Plant (MGP), contains dredged sediments, it may be considered as a source of sediment for this demonstration. A demonstration using 300 – 500 loose cubic yards (lcy) of sediment is proposed for this phase.

RETRIEVING CONTAMINATED SEDIMENTS

During this step, treatable sediment will be removed from the stockpile, screened if needed and then taken to the treatment center for bioremediation. It is anticipated that the harbor will be dredged and the sediment dewatered and stockpiled near the treatment facility by others. It is assumed that the sediment will be dewatered to 50% moisture or less. BSI will then remove the sediments from the stockpile for treatment. As shown in table 3, depending on the action levels, over 150,000 loose cubic yards of sediment may need to be treated prior to beneficial reuse.

TREATMENT PHASE

It is estimated that treatment will take 8 weeks per batch. The former OMC building is large enough to allow treatment of several batches at the same time. If this building can be used BSI has assumed that 75,000 lcy of sediment could be treated per year. Further, BSI has assumed that the building will be made ready for use as a treatment facility under a separate contract. Costs for preparing the OMC building have not been included in the treatment cost estimate.

The sediment shall be remediated to average pile concentrations below the target cleanup goal using BSI's composting system. Failure to achieve cleanup targets will result in a requirement to extend the composting period or return the compost that does not meet targets to be composted again until cleanup goals are met. Achievement of the goals will be measured by averaging the results of the sample analysis across each compost pile and comparing the results to the cleanup goals. Sampling of the piles will be led by the BSI Project Manager with assistance as needed from field personnel. The sampling scheme shall be described in the COMP. BSI will provide all equipment needed for sample processing.

Compost pile turning and monitoring for oxygen, pH, temperature, and moisture shall be the responsibility of BSI. The frequency of these activities shall be sufficient to ensure achievement of the cleanup goals. BSI will also be responsible for moisture addition to the piles and all other activities necessary to ensure that the remediation proceeds successfully.

Batch size and numbers of piles are at the discretion of BSI.

HANDLING CONTACT WATER

It is assumed that the dredged sediment will be de watered prior to treatment. If the sediment cannot be dewatered prior to treatment or if desired BSI will dewater the sediment for an additional cost. Any contact water developed during the dewatering or treatment of the contaminated sediments will be first used in the process, if there is any excess it will be pretreated to North Shore Sanitary District limitations and Discharged to the municipal sewer.

EQUIPMENT

BSI will provide all equipment needed to conduct the contracted cleanup. When appropriate, subcontractors and vendors will be used to provide services. BSI plans to utilize its Wendy compost/soil turner, front end loader(s) and screen to conduct the initial optimization Phase. Additional equipment will be mobilized when operations scale up to full production.

AMENDMENTS

To facilitate the bioremediation of the contaminated sediment, amendments such as; organic materials, water, air and mineral additives will be mixed with the sediment. These materials are natural and will be obtained from sources as close to the treatment facility as possible. Although the exact materials and mixture proportions are proprietary, the nature of these amendments can be revealed in detail. These materials may be fibrous, may be granular or may be amorphous. They can be dry, damp or liquid. They will be non hazardous, non explosive and non flammable. Handling characteristics of each ingredient will be taken into consideration during their use. Generally the amendments include materials that contain such things as carbohydrates, cellulose, lignin, protein, nutrients and minerals needed for growth of biodegrading microbes. Further, addition of proprietary genetic expression factors may be used to enhance the remediation of the more difficult contaminant chemicals.

TRANSPORT TREATED SEDIMENTS TO STOCKPILE WITHIN 0.5 MILES

The treated materials may be suitable for various restoration projects in the community. To facilitate creating this proposal it has been assumed that the treated sediment will be transported and applied within 0.5 miles if the treatment facility. Additional uses of the treated sediments would be contemplated if the community desires. Costs for any additional distance and spreading requirements can be added to this basic price.

PLACEMENT SITE RESTORATION

If desired, BSI will restore the treated sediment placement area by establishing appropriate grass and cover plants. This would include grading for drainage, amending the surface for sustainable vegetation and seeding.

HEALTH AND SAFETY

BSI will employ the services of a registered health and safety professional to establish the parameters for employee protection. This will be in compliance with relevant local state and federal regulation including those of the Occupational and Safety and Health Administration (OSHA)

AIR MONITORING

Periodic air monitoring will be completed to certify that activities are within regulated standards.

Ambient air monitoring inside the composting building when needed will be performed with the following equipment or equivalent:

- Flame Ionization Detector (FID) or Photo-ionization Detector (PID) – Foxboro, Organic Vapor Analyzer (OVA), or equivalent.
- Combustible Gas Indicator (CGI) – ISD, Inc. MX241 CGI, or equivalent.

BSI will provide this equipment and its personnel will be familiar with its calibration and use. Adequate ventilation in the building is required to ensure worker safety. In addition, if and when necessary, the workers shall be required to wear appropriate personal protective equipment (PPE).

PERMITTING

It is assumed that as part of a super fund site that permitting will be covered by the regulating authority. BSI will comply with all local state and federal regulations.

WASTE HANDLING AND DISPOSAL

Ordinary general wastes including: office and lunch room trash will be disposed of as such. Although none is expected, any separated solid wastes generated from processing the contaminated sediments will be disposed as allowed by the regulating authority. Costs for this waste disposal will be passed on to the client. BSI will not act as generator for separated wastes.

SCHEDULE AND TERM

BSI is prepared to discuss a mobilization and treatment schedule that will coincide with dredging activities. BSI is able to plan and begin the Field Optimization / Demonstration Phase on the sediments previously dredged and piled on the former MGP site within 30 days. Immediately following, BSI would develop plans for full scale operations which would commence upon approval of work plans.

According to the bench test, treatment goals will likely be met within 8 weeks of treatment for each batch. BSI believes if a sufficient size treatment facility can be constructed that the dredged sediments can be treated within 48 months of active remediation. The number and size of batches will impact the time line and may depend on factors such as the available area for the remediation facility. BSI is willing to discuss the overall schedule as it relates to cost.

PROVISIONS AND ASSUMPTIONS

SITE ACCESS CONTROL

The BSI shall control access to the site, as described in the Health and Safety Plan. All personnel who enter the exclusion zone shall have current 40-hour Occupational Safety and Health Administration (OSHA) hazardous waste operations and emergency response (HAZWOPER) training and medical surveillance. If BSI enters into a contractual relationship with another company for any portion of this work, BSI shall ensure that its personnel adhere to all requirements in the Work Plans.

MINIMUM QUALIFICATIONS CRITERIA

BSI and any of its vendors or subcontractors must meet the following minimum criteria and must maintain these minimum criteria throughout:

1. Be licensed in an appropriate classification with the State of Illinois (if required by state) for the specific work responded to by the Subcontractor. The operator of each piece of equipment used must be so licensed or qualified. License must be current and active throughout the term of the performance.

2. Capable of providing equipment and materials in compliance with the design specifications. All BSI and Subcontractor personnel other than those who will have no contact with contaminated sediment shall have documented, OSHA-mandated health & safety training, including medical monitoring and respirator fit testing, prior to arrival on site.

3. Backhoe/excavator operators shall have previous experience in backhoe/excavator operation and the excavation of sediment at hazardous waste sites.

4. Subcontractor shall have full understanding of the details of the OSHA personal protection levels to be used, the project Health and Safety Plan (to be provided by BSI on contract award), USACE construction requirements, and USEPA Region V SOPs.

FIELD PROVISIONS

BSI and its Subcontractors shall comply with the following provisions through the project:

1. Notwithstanding any provisions contained elsewhere in this subcontract, BSI's Contractual Representative is the only person authorized to approve changes to any of the requirements herein.

2. Overall technical direction in the field will be provided by the BSI Project Manager who is responsible to BSI for management and direction of all BSI and subcontractor personnel on site. Technical direction is defined as providing clarification of the SOW, but does not

constitute authority to modify the SOW, delivery schedule, or any other actions that may affect the subcontract prices. All questions regarding scheduling or overall scope of work issues shall be directed to the BSI Project Manager who will then resolve the inquiry with the appropriate contracts representative.

3. Equipment shall be maintained throughout the program.

4. The windrow turner operator(s), equipment maintenance technician(s), field technician(s), backhoe operator(s), and truck driver(s) must be knowledgeable about the requirements necessary to meet the specifications in this SOW and must be able to carry out the requirements of the specifications independent of other activities at the site.

5. BSI and its Subcontractors shall provide all labor, equipment, and materials necessary to complete the work described herein, including heavy equipment, waste containers (tanks, drums), vibrating or other mechanical sediment screen, dump trucks, front-end loaders, windrow turner, water pumps, pressure washers, flow meter, and all other required tools. All required Subcontractor-supplied materials and spare parts must be onsite or readily accessible in adequate quantities at commencement of site preparation to ensure uninterrupted operations.

6. It is recognized that BSI has knowledge of the location of the work, the access routes to the location of the work, limited information regarding surface and subsurface conditions, and that BSI is obligated to advise Subcontractors of any known conditions that may affect performance of this contract.

DECONTAMINATION

Decontamination of field equipment shall be conducted in accordance with USEPA Region V protocols.

1. Before the commencement of excavation operations, before leaving the exclusion zone, and before departure from the site, all excavation, transportation, screening, and composting equipment shall be decontaminated.

2. All heavy equipment shall be inspected on site by BSI to ensure that oil, grease, hydraulic fluid, etc. have been cleaned and that there are no leaking seals, gaskets, or fluids.

3. All sampling and monitoring equipment (i.e. hand augers, bowls, spoons, oxygen probe, and pH meter) shall be decontaminated using the following procedures:

a. Clean with potable water and laboratory detergent using a brush or steam cleaner to remove particulates and surface films;
b. Rinse with potable water;
c. Rinse with deionized water;

d. Wrap in clean, unused plastic or tin foil (if appropriate) to prevent contamination of cleaned equipment during storage or transport.

The Subcontractor shall ensure that all equipment and tools used are decontaminated before leaving or are sufficiently wrapped or shielded before transport. The backhoe/excavator bucket, the dump truck, and other tools shall be decontaminated.

HEALTH AND SAFETY

This section summarizes the health and safety measures. BSI will make available a copy of its Corporate Health and Safety Plan (CHSP). BSI shall provide all of the necessary Subcontractor personnel health and safety certifications prior to initiation of field work. The maintenance of good health and the provision for the safety of onsite personnel will be of major concern. BSI has identified both medical surveillance and safety programs that will afford onsite personnel more than adequate protection. Additionally, all site personnel must be in compliance with OSHA training requirements. The main points of this plan include medical examination and safety equipment use and procedures. Each of these points is described in greater detail in the following sections.

BSI and any vendors or subcontractors shall comply with all health and safety requirements. BSI reserves the right to cease operations if the onsite Manager determines that health and safety requirements are not being followed. Each person shall be responsible for complying with the project CHSP and with the direction of the BSI Health and Safety Officer and/or BSI Site Manager.

MEDICAL SCREENING AND HEALTH EXAMINATIONS

All personnel should be participants in the CHSP under OSHA regulations. As participants field personnel should undergo health monitoring so that their health may be protected as well as their physical ability to perform the job. Prior to initiating activities BSI will pre-establish a record of health monitoring for Subcontractor personnel at risk. At a minimum, this should include an annual physical examination.

PERSONNEL SAFETY

In order to provide the greatest degree of safety to onsite personnel may be required to wear personal protective equipment. BSI decontamination procedures shall be followed either routinely at the end of the day or for the treatment of accidental exposure to potentially hazardous chemicals.

Safe work procedures must be followed and personal protective equipment must be used for preventing worker exposure to toxic materials. The success of work procedures and protective equipment in protecting worker health is greatly dependent on worker cooperation.

It is understood that the more encumbered with protective equipment the worker becomes, the more difficult it is for him to perform the job expeditiously. However, the following Standard Operating Procedures (SOPs) in this section are a practical balance of worker protection and

freedom of movement that should allow the work to be conducted without compromising worker health and safety.

SITE HEALTH AND SAFETY PROCEDURES

Procedures to be employed to ensure personnel health and safety are outlined in the following section. The BSI Project Manager will have the authority to enforce these procedures.

1. Designated safety equipment shall be worn at all times.
2. Wearing contact lenses shall be avoided when possible.
3. Eating, drinking, smoking, chewing gum, or chewing tobacco shall not be permitted in the immediate vicinity of the composting facility.
4. Gloves shall be removed, hands and forearms shall be washed, and personnel shall leave the composting facility, as appropriate, before eating, drinking, or smoking.
5. Open flames are not permitted without express permission of the Project Manager, anywhere on the site.
6. Proper decontamination procedures shall be followed before leaving the site area. Sediment, rock, compost, or surface materials shall not be handled without protective gloves.
7. Additional safety equipment, including respirators and goggles or face shields, as appropriate, shall be put on at the first sign or suspected sign of free hazardous materials.
8. The use and maintenance of all respirators shall be in accordance with the manufacturer's instructions. Only NIOSH/MSHA-approved respirators shall be used.
9. No one shall use a respirator without prior training by someone familiar with its proper use.
10. All personnel shall be qualitatively fit-tested with their respirator before working in the field.
11. Beards shall not be permitted. Respirator face pieces must contact the skin directly.
12. Vaseline or other materials shall not be used to provide a proper seal.

EMERGENCY PROCEDURES

A site-related emergency is defined as an accident, illness, or personal exposure to hazardous substances. The response to an emergency situation is two-fold, obtaining assistance and treating the problem. All site personnel will have a list of emergency telephone numbers, including police, fire department, hospital, and poison control center. At least one member of the field team shall be certified to administer CPR and First-Aid.

ATTACHMENT A
PRELIMINARY FIRM FIXED PRICE SCHEDULE

Item/Activity	Estimated Quantity	Unit Price ($)	Total FFP ($)
A. Mobilization	Lump Sum		
Mobilization	1	$75,000	75,000
Site preparation	1	TBD[3]	
B. Demonstration / Optimization 300-500 lcy	Lump Sum		
Including work plan development	1	$180,000	180,000
C. Retrieve and Transport Sediment	loose cy		
	179,099	TBD[4]	
D. Treatment	loose cy		
	179,099	$36.00	$6,447,564
E. Site Restoration	Acres		
	20	TBD[5]	
F. Demobilization	Lump sum	50,000	
	1		
Total		TBD	TBD

[3] Preparation costs depend on the site parameters yet to be determined.
[4] Retrieval cost depends on the location of the dewatered material and if a separate extraction operation is needed.
[5] The location or size of the treated soil deposit area has not been determined.

ATTACHMENT B
BENCH TEST

BSI Environmental, Inc. (BSI) was asked to conduct a study and prepare this report as an evaluation of the potential of remediating the contaminated sediments found in the upper levels of the Waukegan Harbor. BSI obtained samples and evaluated them in our partner laboratory in Germany. This laboratory routinely reviews soil and sediment samples to determine the appropriate treatment method. The lab performs 80% of these studies in conjunction with treatment in one of many fixed and field based treatment processes that include; soil washing, thermal-desorbtion, bioremediation and water treatment. These results are presented on the following pages, and are for information and support to the Statement of Work and proposal to conduct full scale treatment of the sediments. The information in this document is proprietary and intended to be used only by BSI to evaluate and design a sediment treatment method for use on the Waukegan Harbor Sediments.

Sampling

On December 2, 2003, BSI personnel collected six bulk samples from the Waukegan Harbor. They were collected using a Ponar hand dredge from a work boat. Samples locations were identified by reviewing analytical data from previous site characterization prepared by others. A list of the samples is included in the Table below.

Table B-1. Bulk Sample Data, Waukegan Harbor Sediment Waukegan, Illinois

Waukegan Harbor Sample List		
Sample Location description and Nearby USACE Sample data[6]	Lab Values PCB 1248 mg/kg (ppm) Wet Basis	GPS Location
1. Near N end of the E finger dock at marina near, WIH 0995 -003 – 8.9ppm	3.9	16T 0432265 4690232
2. East of Marina near, WH 2002 07 – 13.9ppm	2.5	16T 0432384 4690186
3. Center of channel south GM property extension near, WH 0496 13 or 17 – 7.3ppm	6.5	16T 0432336 4690635
4. Center of channel at bend into new slip north end of harbor near, WH 0496-14 - 7.7ppm	6.5	16T 0432382 4690848
5. Near shore east of cement terminal inline with silos, WH 2002 09 -29.8ppm	6.4	16T 0432184 4690406
6. Near shore east of cement terminal inline with silos, WH 2002 09 -29.8ppm	7.6	16T 0432187 4690379

[6] USACE estimate 11-2003

	Volume of the sediment above the contaminant level	
Contaminant level	**m3**	**yd3**
0	195,598	255,647
1.0	121,512	158,817
2.0	101,059	132,084
3.0	76,016	99,354
4.0	46,872	61,261
5.0	25,628	33,496
10.0	2,369	3,097
15.0	822	1,074
20.0	260	340
25.0	34	45

Sub-samples of each of the bulk samples were submitted for analytical testing at Continental Analytical Services, Inc., Salina, Kansas. Results of these samples ranged from 2.5 to 7.6 mg/kg (parts per million) PCB's (Aroclor-1248) on a wet basis. The four most concentrated samples were blended to form a composite sample for Treatability testing.

BENCH SCALE TREATABILITY TEST

The composite sample was analyzed and found to have a concentration of 3.9 mg/kg PCB's. Information provided by Kevin Adler, EPA, indicates that the concentration of PCB contamination in the harbor is 4 mg/kg or less in greater than 76% of the contaminated sediments and 5 mg/kg or less in nearly 87% of the contaminated sediments. BSI considered the sample to be representative based on this data.

Initial physical and chemical examination of the sediments suggested that an aggressive biotreatment approach would be the most feasible approach. BSI selected two composting methods for Treatability testing. Both methods involved the addition of organic substrates, chemical nutrients and microbial stimulants.

To reduce analytical variability, or "scatter", three discrete sub samples were collected for each sampling event. One sampling event was conducted on the material as received to establish a "Baseline" or starting point. Another sampling event was conducted immediately after the sediments were conditioned with organic substrates, chemical nutrients and microbial stimulants. Sampling events were then conducted at approximately one week intervals.

A negative control was also conducted to determine if any reduction in PCB concentration would be observed due to physical processes in "unamended" sediments.

After three weeks of treatment the PCB concentration in Test A averaged 0.56 mg/kg and Test B averaged 1.1 mg/kg. The negative control averaged 3.8 mg/kg.

The results indicate that the BSI biological treatment can reduce the Waukegan Harbor Sediments to below 1 mg/kg PCB's.

ATTACHMENT C
LAB REPORT

LAB

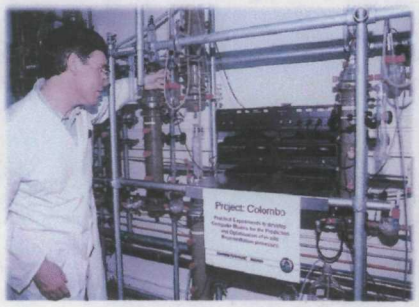
BSI engaged the services of its partner lab located in Ganderkesee Germany to conduct the Treatability test. Analysis is the key element for assessing environmental remediation methods. Effective treatment of soil, sediments, water and air cannot be carried out until the contamination is known in detail.

Alphacon GmbH services BSI's world wide remediation group. Samples are analyzed for both on site and fixed remediation centers in this laboratory. The lab is familiar with all methods for complete biological, chemical and physical investigations. Samples analyzed for this study were subject to EPA standard methods.

Qualified staff and state-of-the-art equipment guarantee reliable measurement data that are necessary for supporting remediation concepts of all types. These scientists conduct complete interpretation of the results as well as project-related consulting as a matter of course.

Research and development

Research is the foundation for all innovative and targeted work. The BSI partner laboratory at Ganderkesee includes scientific experts experienced in practical remediation efforts that have included feasibility studies, implementation of laboratory and technical center tests as well as optimization of existing technologies.



Through its partner lab, BSI is in contact with universities and research institutes and support fields of application-oriented environmental research. Alphacon works closely with federal German authorities and the European Union by offering its experience and state of the art facility to conduct biotechnological research projects of worldwide significance.

The Waukegan Harbor Treatability study is attached on the following pages.

alphacon gmbh
analytik immissionsschutz consulting

Status Report

Laboratory microbiology degradation test

Project „Waukegan harbour sediment with PCB“

Ganderkesee, Germany
04-01-30

Meyer
head of laboratory

Alphacon GmbH
Bergedorfer Straße 49
D-27777 Ganderkesee
Germany

Deutscher Akkreditierungs Rat
DAR
DAC-P-0131-01-00

According to DIN EN ISO/IEC 17025 by the roof German Akkreditierungsstelle Chemie GmbH accredited examining laboratory. The accreditation only applies to the test procedures listed in the document.

For the analytics the competence was confirmed to the laboratory by residual wastes on federal properties the roof in the context of the agreement between the regional finance office (OFD) Hanover and the DACH Gemany

alphacon gmbh
analytik immissionsschutz consulting

	polychlor. Biphenyls, PCB (µg/kg TS) analysis 1	polychlor. Biphenyls, PCB (µg/kg TS) analysis 2	polychlor. Biphenyls, PCB (µg/kg TS) analysis 3	**polychlor. Biphenyls, PCB (µg/kg TS) average**	humidity (%)	temperatur °C
original sample, 17.12.2003	3900	3900	3900	**3900**	65,5	20,3
original sample, 19.12.2003	4200	3900	3900	**4000**	66,6	20,1
original sample, 26.12.2003	3900	3900	3900	**3900**	69,3	19,8
original sample, 02.01.2004	4100	3900	4000	**4000**	66,4	21
original sample, 09.01.2004	3800	3900	3700	**3800**	70,9	20,4

	polychlor. Biphenyls, PCB (µg/kg TS) analysis 1	polychlor. Biphenyls, PCB (µg/kg TS) analysis 2	polychlor. Biphenyls, PCB (µg/kg TS) analysis 3	**polychlor. Biphenyls, PCB (µg/kg TS) average**	humidity (%)	temperature °C
original sample, 17.12.2003	3900	3900	3900	**3900**	65,5	20,3
sample, test 1 with ingredient A, 19.12.2003	2600	1400	1800	**1933,333333**	58,4	22,6
sample, test 1 with ingredient A, 26.12.2003	1100	2000	800	**1300**	65,9	25,6
sample, test 1 with ingredient A, 02.01.2004	2100	1100	500	**1233,333333**	86,9	31,6
sample, test 1 with ingredient A, 09.01.2004	380	1200	100	**560**	79,9	30,9

	polychlor. Biphenyls, PCB (µg/kg TS) analysis 1	polychlor. Biphenyls, PCB (µg/kg TS) analysis 2	polychlor. Biphenyls, PCB (µg/kg TS) analysis 3	**polychlor. Biphenyls, PCB (µg/kg TS) average**	humidity (%)	temperature °C
original sample, 17.12.2003	3900	3900	3900	**3900**	65,5	20,4
sample, test 2 with ingredient B, 19.12.2003	1800	900	900	**1200**	53,6	23,9
sample, test 2 with ingredient B, 26.12.2003	80	1300	1600	**993,3333333**	52,5	28,1
sample, test 2 with ingredient B, 02.01.2004	700	1100	870	**890**	67,3	33,6
sample, test 2 with ingredient B, 09.01.2004	500	1500	1300	**1100**	65,5	34,6

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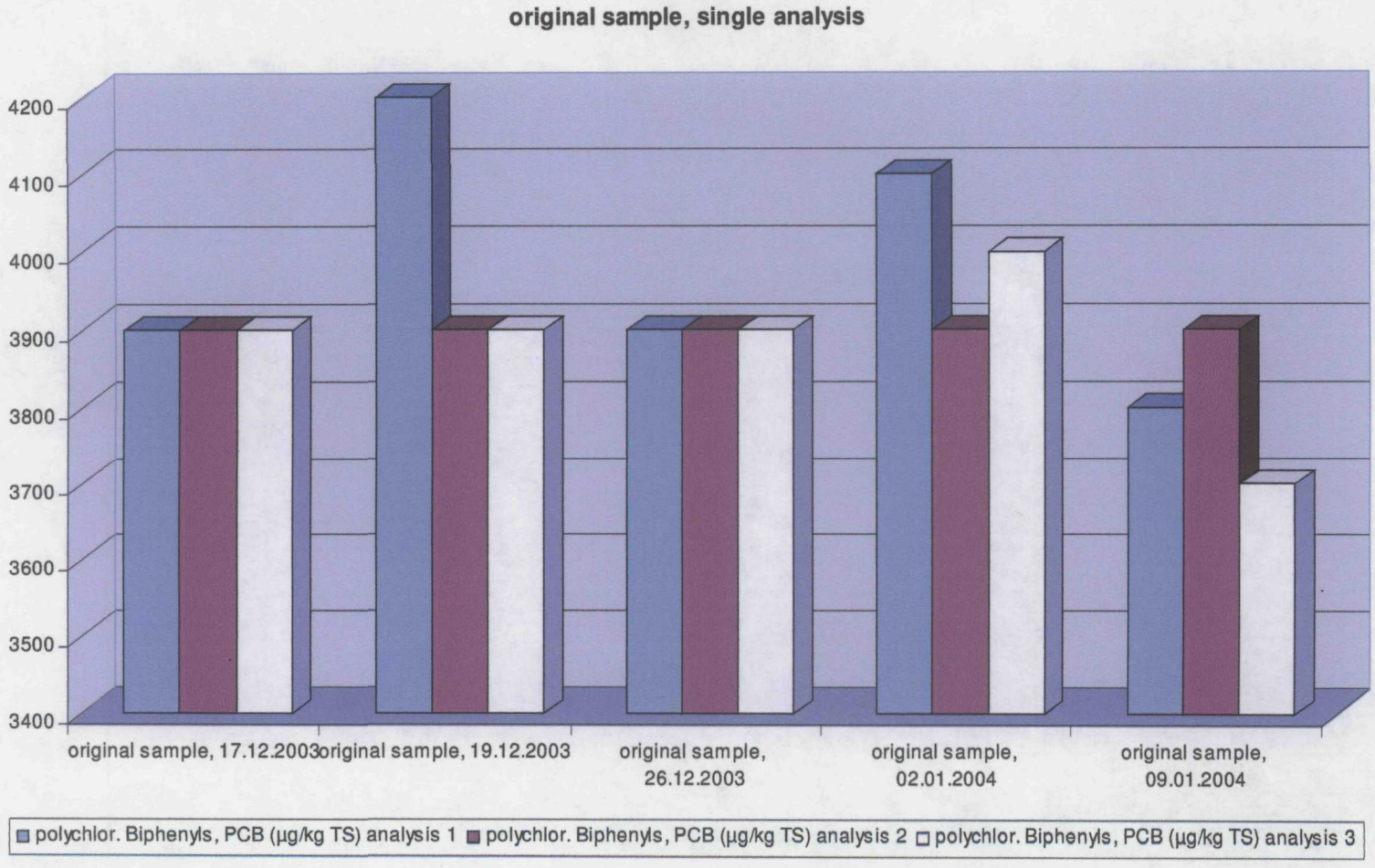

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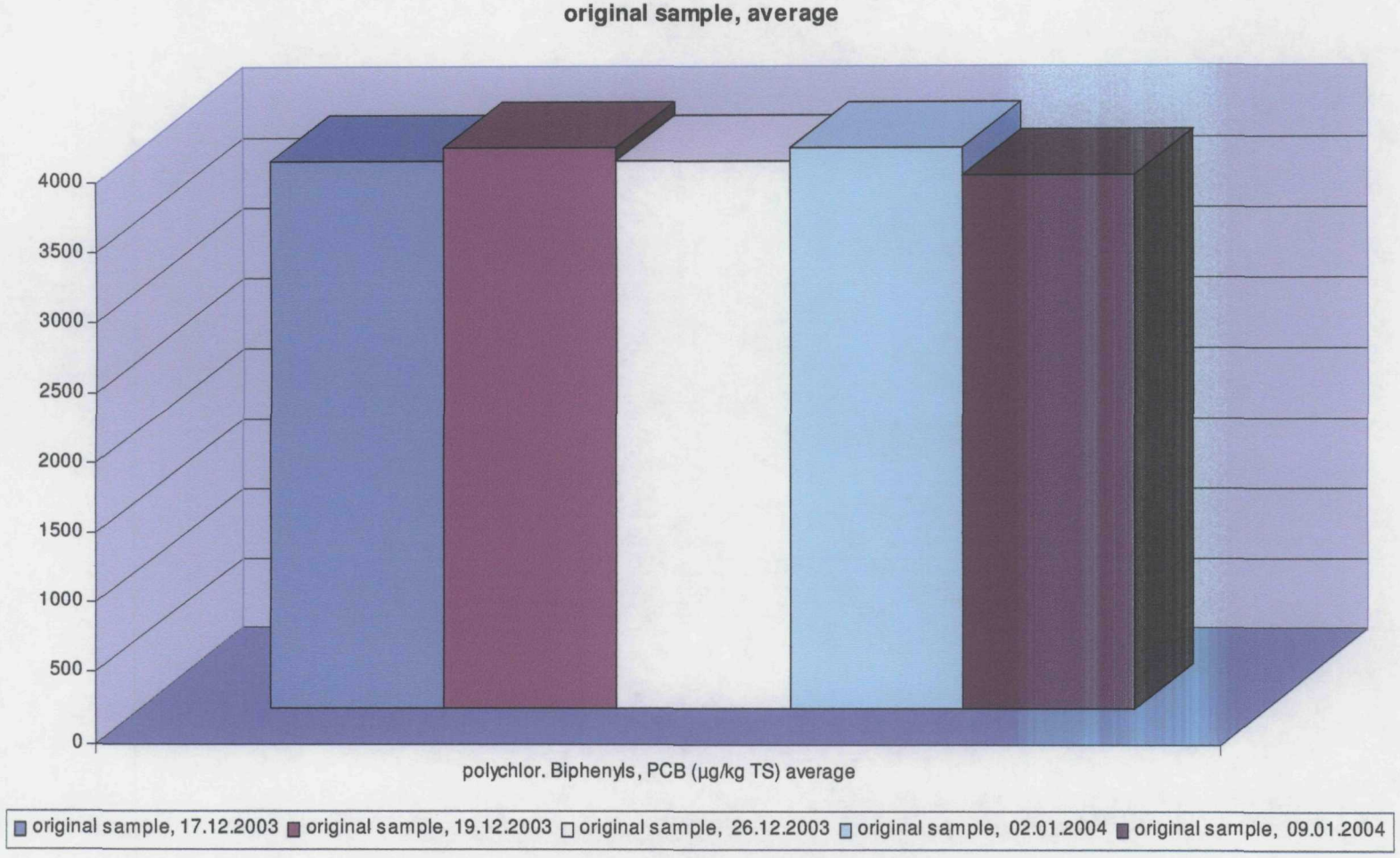

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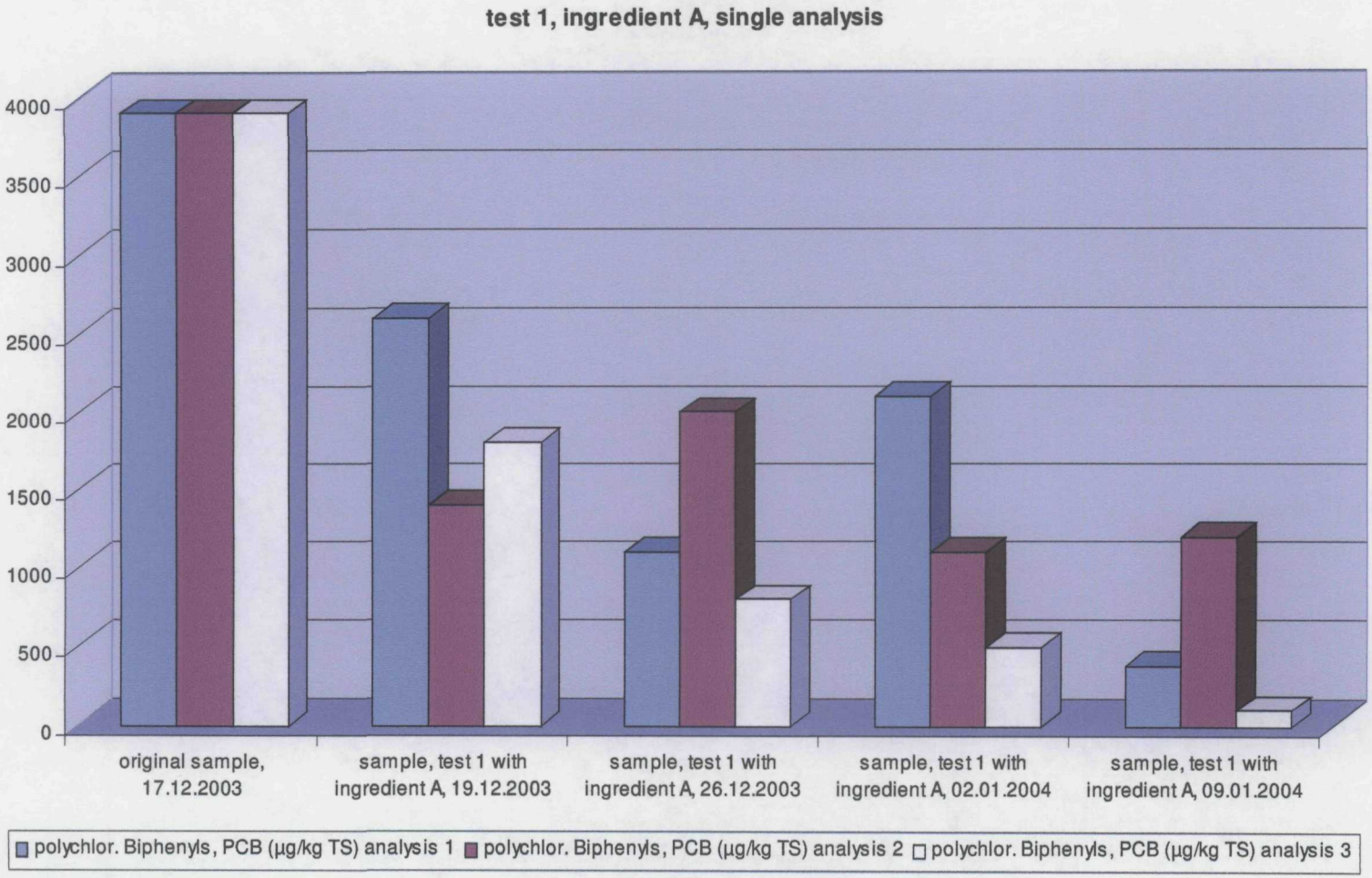

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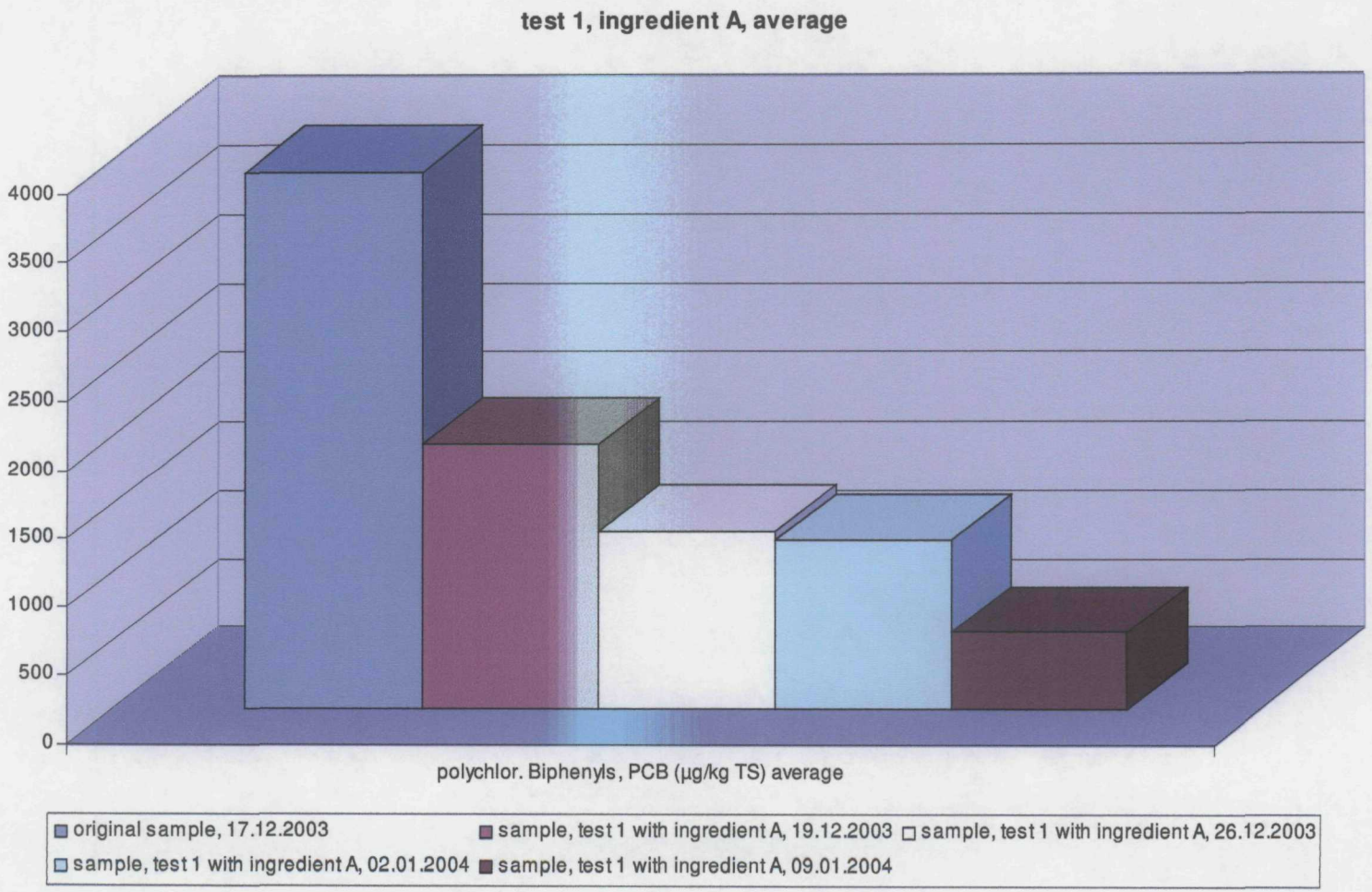

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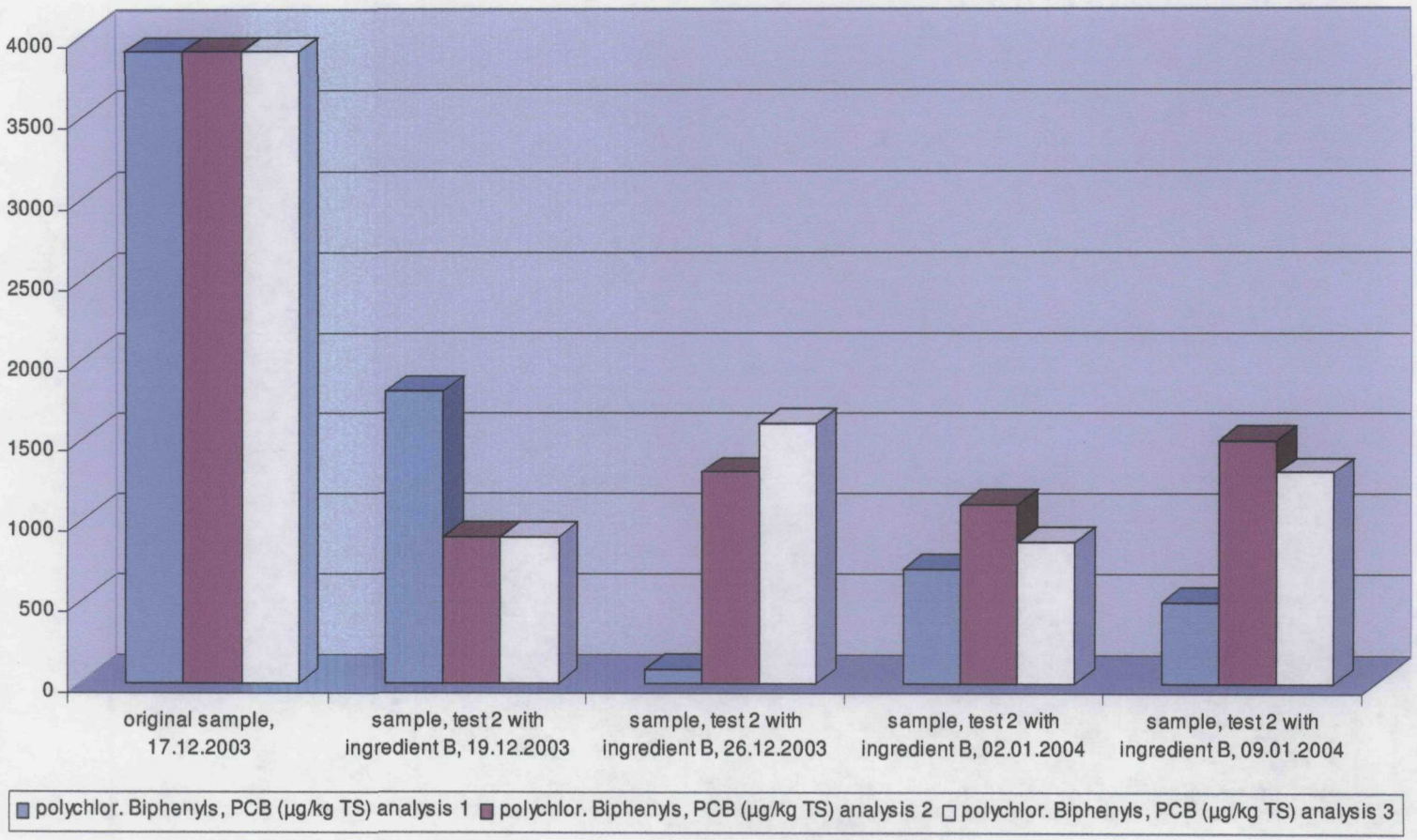
test 2, ingredient B, single analysis



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